Brookville Mining Equipment Corporation
Product Information Bulletin 58 (02-12-04)
Brookville Gearbox Driven Axles
Safety Notice of Proper Operation

Purpose:

Machines equipped with gearbox driven axles are designed with a gearbox and brake fitted onto each axle. This provides two separate drive and brake systems for the safety of the operator, passengers, and nearby personnel in the event of a failure of one of these systems. If a brake should fail, the brake of the other axle will allow the machine to be stopped. As with the gearbox, if one should fail the other still allows braking and maneuverability if the machine must be moved. The design was intended for both gearboxes and brakes to be operational at the same time. Safety is greatly compromised when one or more components are not functioning. The machine can be operated to a safe location where repairs can be made but **IS NOT** be used in normal operation until repairs are made.

Action:

In the event a gearbox or brake on one of these axles fails, T**HE MACHINE IS TO BE REMOVED FROM SERVICE IMMEDIATELY.**

If further information is desired, please contact Brookville Equipment Corporation at (814) 849-2000.

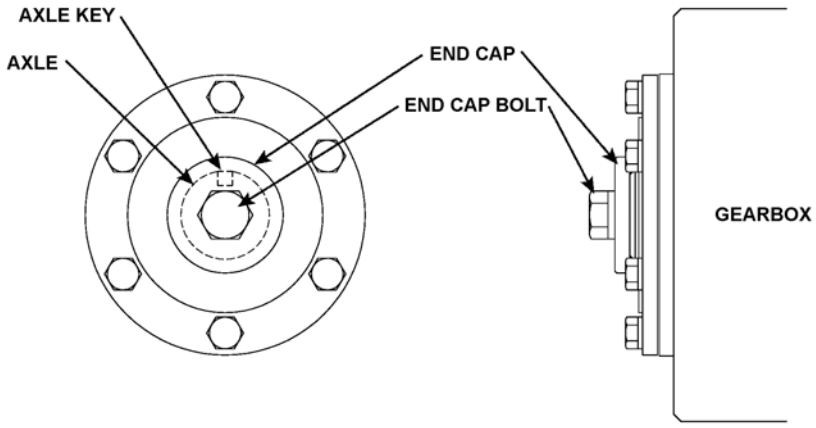
Brookville Mining Equipment Corporation
Product Information Bulletin 59 (02-12-04)
Brookville MC or Hub City Gearbox
Axle End Cap Security

Purpose:

The axle end cap is fastened to the end of the axle at the gearbox. This end cap prevents the axle key from falling out and therefore allowing the gearbox to spin on the axle. This end cap needs to be periodically checked for security and replaced immediately if missing.

Action:

Brookville recommends a weekly check of the axle end cap be added to the machines maintenance schedule. Inspect the security of the end cap bolt and end cap. In the event the end cap is missing, check for the presence of the axle key. If present, replace the end cap **IMMEDIATELY**. If the axle key is missing further action must be taken to be sure the gearbox is properly aligned on the axle shaft and the axle key and end cap replaced **IMMEDIATELY**.



If further information is desired, please contact Brookville Equipment Corporation at (814) 849-2000.

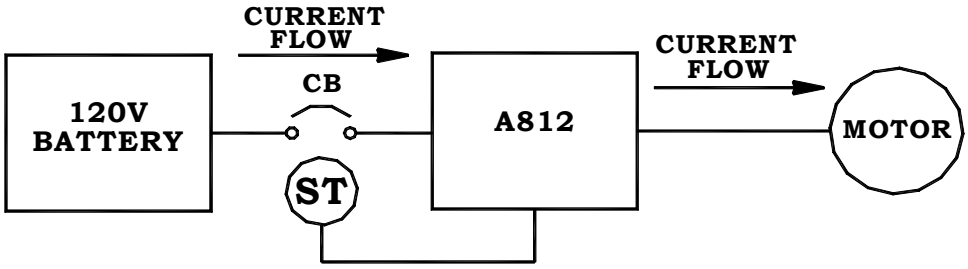
Brookville Mining Equipment Corporation
Product Information Bulletin 60 (02-12-04)
Brookville Battery Units
Installation of a Braking Module

Purpose:

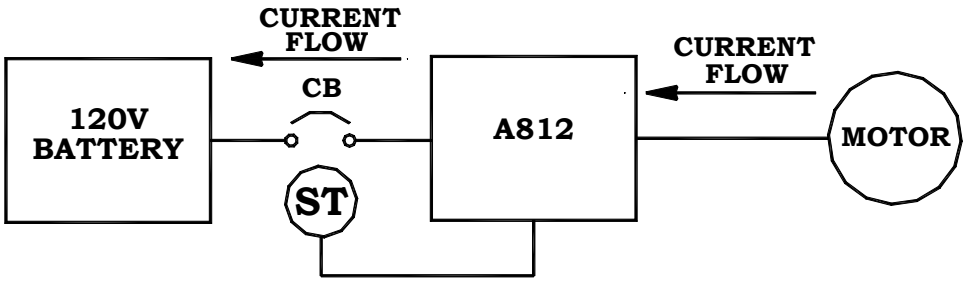
This information bulletin is to provide information on improving electrical braking on Brookville battery machines. It has recently been discovered that operating a battery machine with a faulty battery could result in loss of regenerative braking due to an over voltage condition. The following information explains the how regenerative braking operates and why a brake module should be added.

Current Machine Operation:

During normal tramming and acceleration, current flows from the battery to the A812 controller and then to the motor.



When an electric vehicle is slowing down, the motor becomes a generator and provides energy to the batteries. An additional benefit of this process is the braking effect of the motor on the vehicle, thereby reducing mechanical brake wear. During “regen” braking, current flows from the motor to the A812 and then to the battery. This current is controlled to provide smooth electrical braking.



Due to the energy returning to the batteries during regen braking, the battery voltage will rise. For example, under normal conditions a “healthy” 120V battery absorbing 300A of regen current might show 150V for a short duration. There are some instances that may cause the voltage level to rise to higher levels. To protect the A812 controller and motor in the event of these higher voltages, two levels of over-voltage protection are provided:

165V – the A812 will be inhibited momentarily until the voltage drops below 160V after which braking can be resumed.

200V – the A812 shuts down and trips the circuit breaker.

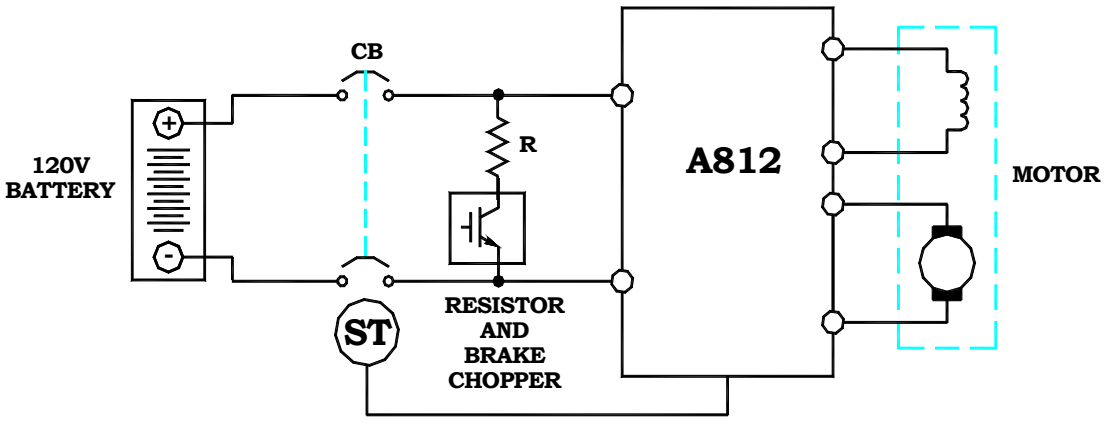
If the internal impedance of the battery happens to increase, the resulting battery voltage may rise above the 165V protection level during hard electrical braking. Some of the reasons for this increased internal impedance may be:

- Low water level
- Bad cell
- Shorted cell

When the battery is healthy, its voltage at 300A braking current is less than 160V, but if the water level is low (or other battery related problem) it might go above 165V and momentarily inhibit the A812, in which case the operator will loose electrical braking control until the voltage returns below the trip level.

Machine Operation with Added Brake Chopper:

The Over Voltage trip problem with a faulty battery can be eliminated by the addition of a brake chopper as shown below. The chopper is set to turn ON at 155V. If the battery impedance has increased, the resistor will be switched ON to absorb the excess energy during regen braking to maintain the battery voltage level less than 160 V.



The Brake Module also provides a contact closure, which can send a signal to the vehicle operator indicating repeated operation of the braking module. This would be an indication of battery degradation alerting the operator to have maintenance of the battery performed. This contact can be programmed to activate after a preset number of cycles in a set period of time to avoid nuisance indications and allow for self resetting of the indicator.

It is very important to maintain a healthy battery by ensuring that the water level in all cells is always at the appropriate level. A regular battery maintenance schedule is important to ensure:

- Safety during vehicle operation
- Longer battery life
- Longer vehicle operating time before battery is recharged
- Better regen braking
- Increased mechanical brake pad life

Please note the purpose of this system is to prevent loss of regenerative braking under normal operating conditions. Instance where the E-Stop button is pressed, all electrical power to the unit is disconnected. This disables all electrical related functions including but not limited to tramming, regenerative braking, lights, sanders, horn, etc.

Action:

Brookville recommends all equipment built before January 1, 2004 be upgraded with a Braking Module kit designed for the particular machine model and a regular battery inspection be added to the maintenance schedule.

Units Affected:

Brookville manufactured battery machines built prior to January 1, 2004.

Verification:

Contact Brookville Equipment Corporation at (814) 849-2000 with the machine model and serial number specifications for a price of the Braking Module kit required for a particular machine.

Brookville Mining Equipment Corporation
Product Information Bulletin 61 (02-12-04)
Brookville Battery Units
Warnings for Engaging the E-Stop on Personnel Carriers

Purpose:

Operators need to be aware that engaging the E-Stop disconnects all electrical power to the unit, disabling all related functions including but not limited to tramming, regenerative braking, lights, sanders, horn, etc. Engaging the E-Stop will also apply the emergency/parking brakes.

Action:

Brookville has available a warning label (See Sample Below) to be applied near the E-Stop warning operators of this situation. Contact Brookville Equipment Corporation at (814) 849-2000 to have a warning label (part number T739) shipped to you at no charge. It is further recommended all electrical devices and mechanical systems (such as circuit breakers and brakes) be inspected and if found faulty they be repaired or replaced immediately as needed.

Units Affected:

Brookville manufactured battery personnel carriers.

WARNING

ACTIVATING THE E-STOP DISCONNECTS ALL ELECTRICAL POWER TO THE UNIT, DISABLING ALL RELATED FUNCTIONS SUCH AS TRAMMING, REGENERATIVE BRAKING, LIGHTS, SANDERS, HORN, ETC. ENGAGING THE E-STOP WILL ALSO APPLY THE EMERGENCY/PARKING BRAKE.

Brookville Mining Equipment Corporation
Product Information Bulletin 62 (04-19-04)
Brookville Battery Units
Warnings for Engaging the E-Stop on Locomotives

Purpose:

Operators need to be aware that engaging the E-Stop disconnects all electrical power to the unit, disabling all related functions including but not limited to tramming, regenerative braking, lights, sanders, horn, etc. It is very important to remember these locomotives are equipped with and air over hydraulic brake system. Engaging the E-Stop on these units **will not** apply the emergency/parking brakes.

Action:

Brookville has available a warning label (See Sample Below) to be applied near the E-Stop warning operators of this situation. Contact Brookville Equipment Corporation at (814) 849-2000 to have a warning label (part number T739) shipped to you at no charge. It is further recommended all electrical devices and mechanical systems (such as circuit breakers and brakes) be inspected and if found faulty they be repaired or replaced immediately as needed.

Units Affected:

Brookville manufactured battery locomotives.

WARNING

ACTIVATING THE E-STOP DISCONNECTS ALL ELECTRICAL POWER TO THE UNIT, DISABLING ALL RELATED FUNCTIONS SUCH AS TRAMMING, REGENERATIVE BRAKING, LIGHTS, SANDERS, HORN, ETC. ENGAGING THE E-STOP WILL NOT APPLY THE EMERGENCY/PARKING BRAKE. IF NECESSARY THE EMERGENCY/PARKING BRAKE MUST BE APPLIED SEPARATELY BY MEANS OF THE EMERGENCY/PARKING BRAKE CONTROL.